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IN THE CLAIMS

Claim 1. (previously presented)

A filled aperture reflecting telescope primarily used for deep space applications comprising:

a primary mirror comprising a plurality of modular segmented optics coupled to a modular mirror backing structure, wherein said modular mirror backing structure is formed from interlocking at least two of said plurality of interlocking mirror backing structure segments;

a central hole defined within said primary mirror;

a secondary mirror operatively coupled to said primary mirror; and

an optical beam path, said optical beam path being operatively coupled to said secondary mirror through said central hole.

Claim 2. (currently amended)

The reflecting telescope of claim 1, wherein each of said plurality of modular segmented optics comprises:

a front reflecting surface;

a backside;

a plurality of side surfaces defined by said front reflecting surface and said backside;

~~a front grapple fixture coupled to said front reflecting surface;~~

a flexible center attachment coupled to said backside;

a plurality of actuator attachments coupled to said backside; and

a guide attached to said backside; and

~~a rear grapple fixture attached to said backside.~~

Claim 3. (original)

The reflecting telescope of claim 2, wherein a first one of said plurality of modular segmented optics is coupled to an adjacent one of said plurality of modular segmented optics such that a first side surface of said first one of said plurality of

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modular segmented optics substantially abuts an adjacent side surface of said adjacent one of said plurality of modular segmented optics and such that said front reflecting surface of said first one of said plurality of modular segmented optics forms a continuous surface with said front reflecting surface of said adjacent one of said plurality of modular segmented optics.

Claim 4. (original)

The reflecting telescope of claim 1, wherein each of said modular interlocking mirror backing segments comprises:

at least one interlocking attachment(s), each of said at least one interlocking attachments having a plurality of side slots and a top region; and

a plurality of members coupled to at least one of said at least one interlocking attachments.

Claim 5. (Original)

The reflecting telescope of claim 1 further comprising a plurality of support connectors coupled to said secondary mirror and to said mirror backing structure.

Claim 6. (original)

The reflective telescope of claim 1 further comprising an edge truss coupled around said modular mirror backing structure.

Claim 7. (original)

The reflecting telescope of claim 6 further comprising a plurality of support connectors coupled to said secondary mirror and to said edge truss.

Claim 8. (original)

The reflective telescope of claim 2, wherein each of said modular interlocking mirror backing segments comprises:

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at least one interlocking attachment(s), each of said at least one interlocking attachments having a plurality of side slots and a top region; and

a plurality of members coupled to at least one of said at least one interlocking attachments, wherein said center attachment and each of said actuator attachments of each of said plurality of modular optics segments is coupled to a respective top region of said modular interlocking mirror backing segments.

Claim 9. (original)

The reflective telescope of claim 8, wherein said center attachment is coupled to said top region of one of said at least one interlocking attachments.

Claim 10. (original)

The reflective telescope of claim 8, wherein said at least one interlocking attachment comprises a plurality of interlocking attachments.

Claim 11. (original)

The reflective telescope of claim 10, wherein said center attachment is coupled to said top region of one of said plurality of interlocking attachments and wherein each of said plurality of actuator attachments is coupled with a respective top region of another of said plurality of actuator attachments.

Claim 12. (original)

The reflective telescope of claim 10 further comprising a multi-arm guide coupled between one of said plurality of modular optics segments and said mirror backing structure, said multi-arm guide comprising:

a central hub having an inlet region and a protruding region, said inlet region coupled to said center attachment and wherein said protruding region is coupled with a top surface of said at least one interlocking attachment; and

a plurality of arms extending radially from said central hub, each of said arms coupled over a respective one of said plurality of actuator attachments and seated onto at

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least one of said plurality of members.

Claims 13 – 17. (canceled)

Claim 18. (previously presented)

A method for forming a reflective telescope comprising:
providing a satellite having a foundation of an optical structure, said optical structure including an optical beam path;
forming a plurality of interlocking modular segments, each of said plurality of interlocking modular segments comprising a plurality of interlocking attachments and a plurality of members, wherein each of said plurality of interlocking attachments is coupled to at least one said plurality of members and wherein each of said plurality of members is coupled with at least one of said plurality of interlocking attachments;
forming a modular mirror backing structure by interlocking at least two of said plurality of interlocking modular segments;
coupling said modular mirror backing structure to said foundation;
coupling a plurality of modular segmented optics one at a time to said modular mirror backing structure to form a primary mirror having a central hole; and
coupling a secondary mirror to said modular mirror backing structure, wherein said secondary mirror is operatively coupled to said primary mirror and is operatively coupled said optical beam path through said central hole.

Claim 19. (original)

The method of claim 18, wherein forming a plurality of interlocking modular segments comprises:
providing a plurality of interlocking attachments, each of said plurality of interlocking attachments having a top region and a plurality of side slots;
providing a plurality of members having a first end and a second end;
introducing a first end of one of said plurality of members within a first side slot of one of said plurality of interlocking attachments;

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introducing a second end of said one of said plurality of members within a first side slot of a second one of said plurality of interlocking attachments; and

introducing a first end of another of said plurality of members within a second side slot of said first one of said plurality of interlocking attachments.

Claim 20. (original)

The method of claim 18, wherein forming a modular mirror backing structure from said plurality of interlocking modular segments comprises coupling a first end of one of said plurality of members of one of said plurality of interlocking modular segments within a first side slot of another one of said plurality of interlocking modular segments; and

introducing a first end of another one of said plurality of members of said one of said plurality of interlocking modular segments within a first side slot of a third one of said plurality of interlocking modular segments.

Claim 21. (original)

The method of claim 19, wherein coupling a secondary mirror to said modular mirror backing structure comprises:

providing at least one support connector, each of said at least one support connectors having an inner end and an outer end;

coupling an outer end of each of said at least one support connector to an outer side surface of said secondary mirror;

coupling an inner end of each of said at least one support connector to a respective one of said at least one interlocking attachments, each of said respective ones of said at least one interlocking attachment defining an outer periphery of said modular mirror backing structure.

Claim 22. (original)

The method of claim 18 further comprising introducing said outermost end of each of said plurality of members defining said outer periphery within a corresponding

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inner side slot of an edge truss.

Claim 23. (original)

The method of claim 22, wherein coupling a secondary mirror to said modular mirror backing structure comprises:

providing at least one support connector, each of said at least one support connectors having an inner end and an outer end;

coupling an outer end of each of said at least one support connector to an outer side surface of said secondary mirror;

coupling an inner end of each of said at least one support connector to a respective outer side slot of said edge truss.

Claim 24. (currently amended)

The method of claim 19, wherein coupling a plurality of modular segmented optics one at a time to said modular mirror backing structure comprises:

(a) forming a plurality of modular segmented optics, wherein each of said plurality of modular segmented optics comprises a front reflecting surface; a backside; a plurality of side surfaces defined by said front reflecting surface and said backside; a ~~front grapple fixture coupled to said front reflecting surface~~; a flexible center attachment coupled to said backside; a plurality of actuator attachments coupled to said backside; and a guide attached to said backside; ~~and a rear grapple fixture attached to said backside~~;

(b) coupling a flexible center attachment of a first one of said plurality of modular segmented optics to a top region of one of said interlocking attachments; [[and]]

(c) coupling each of said plurality of actuator attachments of said one of said plurality of modular segmented optics to a respective top region of another of said plurality of interlocking attachments; and

(d) repeating steps (b) and (c) for an adjacent one of said segmented optics, wherein a first side surface of said first one of said plurality of modular segmented optics substantially abuts an adjacent side surface of said adjacent one of said plurality of modular segmented optics and such that said front reflecting surface of said first one of

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said plurality of modular segmented optics forms a continuous surface with said front reflecting surface of said adjacent one of said plurality of modular segmented optics.

Claim 25. (currently amended)

The method of claim 24 further comprising ~~(f) repeating step (e)~~ (e) repeating step (d) for at least one more of said plurality of modular segmented optics.

Claim 26. (currently amended)

The method of claim 24, wherein (b) coupling a flexible center attachment of a first one of said plurality of modular segmented optics to a top region of one of said interlocking attachments comprises:

providing a robot having a base structure having a control unit, an arm, and a grabbing structure, wherein said control unit controls the movement of said arm and said grabbing structure;

coupling said robot to ~~said front grapple fixture~~ of a first one of said plurality of modular segmented optics;

moving said arm of said robot towards said a plurality of interlocking modular segments;

moving said arm of said robot further towards said plurality of interlocking attachments to couple said center attachment to a respective top region of one of said interlocking attachments;

moving said arm of said robot further towards said plurality of interlocking attachments to couple said actuator attachment to a respective top region of a respective another one of said interlocking attachments;

moving said arm of said robot further towards said plurality of interlocking attachments until said guide is seated against one or more of said plurality of members;
and

uncoupling said robot from ~~said front grapple fixture~~ first one of said plurality of modular segmented optics.

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Claim 27. (currently amended)

The method of claim 24, wherein (b) coupling a flexible center attachment of a first one of said plurality of modular segmented optics to a top region of one of said interlocking attachments comprises:

providing a robot having a base structure having a control unit, an arm, and a grabbing structure, wherein said control unit controls the movement of said arm and said grabbing structure;

coupling said robot to ~~said rear grapple fixture~~ of a first one of said plurality of modular segmented optics;

moving said arm of said robot towards said a plurality of interlocking modular segments;

moving said arm of said robot further towards said plurality of interlocking attachments to couple said center attachment to a respective top region of one of said interlocking attachments;

moving said arm of said robot further towards said plurality of interlocking attachments to couple said actuator attachment to a respective top region of a respective another one of said interlocking attachments;

moving said arm of said robot further towards said plurality of interlocking attachments until said guide is seated against one or more of said plurality of members; and uncoupling said robot from ~~said rear grapple fixture~~ first one of said plurality of modular segmented optics.

Claim 28. (currently amended)

The method of claim 19, wherein coupling a plurality of modular segmented optics one at a time to said modular mirror backing structure comprises:

(a) forming a plurality of modular segmented optics, wherein each of said plurality of modular segmented optics comprises a front reflecting surface; a backside; a plurality of side surfaces defined by said front reflecting surface and said backside; a ~~front grapple fixture coupled to said front reflecting surface~~; a flexible center attachment

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coupled to said backside; a plurality of actuator attachments coupled to said backside;
~~and a guide attached to said backside; and a rear grapple fixture attached to said backside;~~

(b) providing a plurality of multi-arm guides, wherein each of said plurality of multi-arm guide comprises a central hub having an inlet region and a protruding region, and a plurality of arms extending radially from said central hub;

(c) introducing said center attachment of one of said plurality of multi-arm guides within an inlet region of a multi-arm guide such that said plurality of arms are coupled over a respective one of said plurality of actuator attachments;

(d) coupling said multi-arm guide of a first one of said plurality of modular segmented optics to a top region of one of said interlocking attachments; and

(e) repeating steps (b) and (c) for an adjacent one of said segmented optics, wherein a first side surface of said first one of said plurality of modular segmented optics substantially abuts an adjacent side surface of said adjacent one of said plurality of modular segmented optics and such that said front reflecting surface of said first one of said plurality of modular segmented optics forms a continuous surface with said front reflecting surface of said adjacent one of said plurality of modular segmented optics.

Claim 29. (original)

The method of claim 28, wherein (d) coupling said multi-arm guide of a first one of said plurality of modular segmented optics to a top region of one of said interlocking attachments comprises:

coupling said protruding region with a top surface of said at least one interlocking attachment such that each of said arms coupled over a respective one of said plurality of actuator attachments is seated onto at least one of said plurality of members.

Claim 30. (currently amended)

A method for forming a space telescope comprising:

providing a satellite having a foundation of an optical structure, said foundation ~~having~~ optical structure including an optical beam path ~~having a tertiary mirror;~~

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forming a primary mirror having a central hole, said primary mirror comprising a plurality of coupled integrated modular segments, wherein each of said integrated modular segments comprises a segmented optic coupled to a reaction structure using at least one face sheet actuator;

coupling said primary mirror to said foundation, wherein said optical beam path is closely coupled with said central hole; and

coupling a secondary mirror to said modular mirror backing structure, wherein said secondary mirror is operatively coupled to said optical beam path through said central hole and is operatively coupled to said primary mirror.

Claim 31. (original)

The method of claim 30, wherein forming a primary mirror comprises:

(a) providing a plurality of segmented optics, each of said segmented optics having a front reflecting surface, a backside, and a plurality of side surfaces defined by said front reflecting surface and said backside;

(b) providing a plurality of reaction structures;

(c) coupling at least one face sheet actuator to each of said plurality of reaction structures;

(d) coupling one of said plurality of segmented optics to a respective one of said plurality of reaction structures using said one of said at least one face sheet actuator to form an integrated modular segment; and

(e) coupling one of said integrated modular segments to another of said integrated modular segments such that said front reflecting surface of said first one of said integrated modular segments forms a continuous surface with said front reflecting surface of said another one of said integrated modular segments and wherein a respective one of said side surfaces of said one of said integrated modular segments substantially abuts a respective one of said side surfaces of said another one of said integrated modular segments.

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Claim 32. (original)

The method of claim 31, wherein said one of said integrated modular segments is coupled to said another of said integrated modular segments using an external coupler.

Claims 33 - 42. (canceled)

Claim 43. (previously presented)

The reflecting telescope of claim 1, further comprising a tertiary mirror contained within said central hole and coupled with said optical beam path.

Claim 44. (previously presented)

The method of claim 18, wherein said optical structure includes a tertiary mirror.

Claim 45. (new)

The reflecting telescope of claim 2, wherein said each of said plurality of modular segmented optics further comprises:

- a front grapple fixture coupled to said front reflecting surface; and
- a rear grapple fixture attached to said backside.

Claim 46. (new)

The method of claim 24, wherein said each of said plurality of modular segmented optics further comprises:

- a front grapple fixture coupled to said front reflecting surface; and
- a rear grapple fixture attached to said backside.

Claim 47. (new)

The method of claim 46, wherein (b) coupling a flexible center attachment of a first one of said plurality of modular segmented optics to a top region of one of said interlocking attachments comprises:

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providing a robot having a base structure having a control unit, an arm, and a grabbing structure, wherein said control unit controls the movement of said arm and said grabbing structure;

coupling said robot to said front grapple fixture of a first one of said plurality of modular segmented optics;

moving said arm of said robot towards said a plurality of interlocking modular segments;

moving said arm of said robot further towards said plurality of interlocking attachments to couple said center attachment to a respective top region of one of said interlocking attachments;

moving said arm of said robot further towards said plurality of interlocking attachments to couple said actuator attachment to a respective top region of a respective another one of said interlocking attachments;

moving said arm of said robot further towards said plurality of interlocking attachments until said guide is seated against one or more of said plurality of members;
and

uncoupling said robot from said front grapple fixture.

Claim 48. (new)

The method of claim 46, wherein (b) coupling a flexible center attachment of a first one of said plurality of modular segmented optics to a top region of one of said interlocking attachments comprises:

providing a robot having a base structure having a control unit, an arm, and a grabbing structure, wherein said control unit controls the movement of said arm and said grabbing structure;

coupling said robot to said rear grapple fixture of a first one of said plurality of modular segmented optics;

moving said arm of said robot towards said a plurality of interlocking modular segments;

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moving said arm of said robot further towards said plurality of interlocking attachments to couple said center attachment to a respective top region of one of said interlocking attachments;

moving said arm of said robot further towards said plurality of interlocking attachments to couple said actuator attachment to a respective top region of a respective another one of said interlocking attachments;

moving said arm of said robot further towards said plurality of interlocking attachments until said guide is seated against one or more of said plurality of members; and
uncoupling said robot from said rear grapple fixture.

Claim 49. (new)

The method of claim 28, wherein said each of said plurality of modular segmented optics further comprises:

- a front grapple fixture coupled to said front reflecting surface; and
- a rear grapple fixture attached to said backside.

Claim 50. (new)

The method of claim 30, wherein said optical structure further comprises a tertiary mirror.